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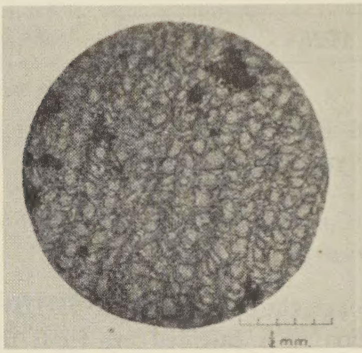
NOTE ON A CALCIFIED LOG FROM THE PITTSBURGH COAL, NEAR MORGANTOWN, WEST VIRGINIA

CHAS. R. FETTKE, *Carnegie Institute of Technology*

During the summer of 1923, through the courtesy of W. W. Dartnell, the writer obtained a portion of a calcified log from the Pittsburgh Coal near Morgantown, West Virginia, which is unique on account of the extent to which the cell structures of the original wood have been retained. The specimen was found in the upper portion of the coal bed in Mine No. 1 of the Connellsville By-product Coal Company at Barker, West Virginia. The log had been flattened before petrifaction set in so that instead of being circular it is now roughly lenticular in cross-section. The part collected, which is 21 inches long, represents only a portion of the log. At the broken end it has a maximum diameter of 11 inches and a minimum of 4 inches. At the opposite end, it tapers to a blunt wedge. No data was obtained in regard to its true length as preserved in the coal. During a brief visit to the locality from which the specimen came, several other logs, similar to the one referred to above, were seen in place in the coal at various levels. They were all in a horizontal position with their flattened surfaces parallel to the bedding of the coal.

It was not until later on, however, after thin sections of the original specimen had been prepared and examined under the microscope, that the true scientific value of the occurrence was realized. A macroscopic inspection gave no hint of the remarkable manner in which the cell structure of the original wood has been preserved. Fig. 1 represents a considerably magnified photomicrograph of a transverse section. The light colored substance consists of dolomitic calcite while the occasional black patches are pyrite. Under crossed nicols, it is found that the interior portions of the tracheid cells are often filled by a single grain of calcite or, at the most, two or three, while the walls and the space between adjacent cells consist of cryptocrystalline calcite.



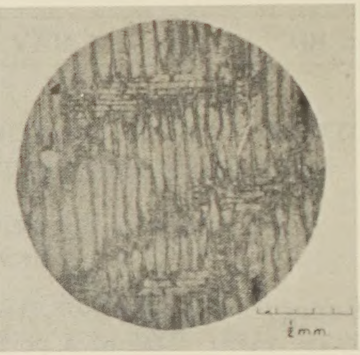


Figure 1. Photomicrograph of transverse section of calcified log from Pittsburgh Coal.
Figure 2. Photomicrograph of radial section.

Amongst the minute grains of cryptocrystalline calcite replacing the walls, a rich brown-colored substance, undoubtedly representing carbonaceous matter derived from the original wood, is present and makes the outlines of the cells stand out. When viewed in a

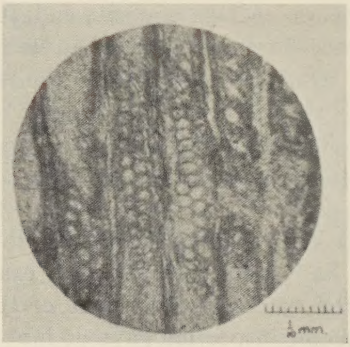


Figure 3. Photomicrograph of bordered pits along tracheids in radial section.

larger field the pyrite is seen to occur along bands parallel to radii and occasionally at right angles to them. It has evidently been introduced later than the calcite and has in part replaced the latter.

In the photomicrograph of a radial section, shown in Fig. 2, taken under the same magnification as Fig. 1, medullary rays and tracheids appear, along some of the latter of which bordered pits can be seen. Fig. 3 shows some of these bordered pits at a much higher magnification. Between crossed nicols relatively coarse calcite is seen to fill the interiors of the tracheids and medullary rays while cryptocrystalline calcite replaces the walls and the space between adjacent cells. Two, three, and sometimes more thin streaks of rich brown carbonaceous material form the outlines of the tracheids while a single streak usually occurs between adjacent rows of medullary rays. The pyrite appears in bands parallel to the tracheids, being occasionally confined entirely to their interiors. The greatest amount of pyrite occurs along narrow crushed zones where the wood structure has been destroyed. Here it is sometimes cut by still later veinlets of calcite. In tangential sections, cross-sections of the medullary rays may be observed as well as bordered pits leading from one tracheid to another.

A quantitative analysis of a representative fragment of the log which had a specific gravity of 2.962 gave the following results:

SiO_2	0.07 per cent
Al_2O_3	trace
Fe_2O_3	0.17
MgO	4.32
CaO	37.18
H_2O+	0.53
H_2O-	0.15
CO_2	33.89
FeS_2	22.24
C	0.88
	99.43

When this is recast into the compounds present, it shows the following percentages of the various constituents:

Dolomitic calcite	.....	75.39 per cent
Calcium carbonate	66.35	
Magnesium carbonate	9.04	
Pyrite	.....	22.24
Limonite	.....	0.20
Silica	.....	0.07
Carbonaceous matter	.....	1.38
Moisture	.....	0.15
		99.43

Just why an occasional log in a coal bed should undergo calcification instead of becoming converted into coal is difficult to understand. Apparently the change took place after the log had become buried in the upper part of the peat deposit which formed the coal bed and the latter had been buried under a load of sediment sufficiently great to exert the pressure necessary to flatten the log. Waters charged with calcium and magnesium carbonates, or possibly sulfates, then permeated the cells and filled them with dolomitic calcite and to a large extent replaced the walls themselves, leaving just sufficient carbonaceous matter to emphasize the outlines of the original cellular structure. The pyrite was brought in in solution at a somewhat later stage and has replaced portions of the calcite. The above described occurrence, in many respects, bears a close resemblance to the calcareous concretions or "coal balls" so rich in well-preserved plant remains, which are occasionally found associated with coal seams, and the process of formation was undoubtedly very similar.

Dr. O. E. Jennings, of the Carnegie Museum, is at present working on the identification of the specimen. A preliminary examination reveals conifer-like structures indicating that the log may represent one of the cordaites.

A NEW THEORY OF THE COMPOSITION OF THE ZEOLITES. PART II

(*Continued from page 97*)

A. N. Winchell, *University of Wisconsin*

2. The Composition of Natrolite, Mesolite, Scolecite, Gismondite and Laumontite

The so-called "natrolite group" of zeolites furnishes one of the most striking examples of the apparent validity of valence-control of isomorphous replacement. It is well known that this "group" consists of the following minerals, the composition being given as heretofore commonly accepted:

Natrolite	$Na_2Al_2Si_3O_{10}.2H_2O$	$a:b:c=0.9786:1:0.3536$
Mesolite	$\left\{\begin{array}{l}Na_2Al_2Si_3O_{10}.2H_2O\\2CaAl_2Si_3O_{10}.3H_2O\end{array}\right\}$	$a:b:c=0.9747:1:0.3122$
Scolecite	$CaAl_2Si_3O_{10}.3H_2O$	$a:b:c=0.9763:1:0.3433$

At first glance the case seems very convincing. However, so far as similarity of crystal form is concerned, the "group" might well include also several other zeolites, as follows, the composition being expressed as heretofore commonly accepted:

Edingtonite $BaAl_2Si_3O_{10}.3H_2O$	$a:b:c=0.9872:1:0.3367$
Thomsonite $(Na_2,Ca)\ Al_2Si_2O_8.2.5H_2O$	$a:b:c=0.9932:1:0.3355$
Gismondite $CaAl_2Si_4O_{12}.4H_2O$	$a:b:c=0.9566:1:0.3188$
Laumontite $CaAl_2Si_4O_{12}.4H_2O$	$a:b:c=1.082\ :1:0.5896$

In fact, Tschermak in his recent comprehensive treatise[1] on the zeolites groups all these zeolites together and calls attention to certain properties they have in common, especially the property of gelatinizing with acids.

Furthermore, in the "natrolite group" the similarity in crystal form is far from complete, since natrolite is orthorhombic, mesolite is triclinic, and scolecite is monoclinic.

It is now generally agreed that two substances are not isomorphous unless they have similar composition as well as similar crystal form. In a general way there can be no doubt that the minerals of the "natrolite group" (and also edingtonite) are similar in chemical composition; but are they sufficiently similar to form a truly isomorphous group? The final test of complete isomorphism is the ability to form mix-crystals or crystal solutions. It is therefore important to learn to what extent natrolite, mesolite and scolecite form mix-crystals. For this purpose a careful selection of all available analyses of these minerals has been made on the same basis as in previous cases, namely, excluding (1) old analyses, (2) those on impure material, (3) those obviously inaccurate, (4) those judged inaccurate because the ratio $Al_2O_3:CaO+Na_2O$ is not almost exactly 1:1. The "superior" analyses selected in this way are the following:

Natrolite: Doelter's[2] Nos. 24, 26, 29, 35, and 37.
- 67. T. L. Walker: *U. Toronto Studies, Geol. Ser.*, **14**, 62, (1922).
- 68. A. H. Phillips: *Am. Jour. Sci.*, **XLII**, 472, (1916).
- 69. G. Tschermak: *Sitz. Akad. Wiss. Wien*, **CXXVI**, 544, (1917).
- 70. F. N. Ashcroft: *Mineral. Mag.*, **XVII**, 305, (1916).

Mesolite: Doelter's Nos. 10, 11, 25, 28, and 37.
- 38, 39. T. L. Walker: *U. Toronto Studies, Geol. Ser.*, **14**, 57, (1922).
- 40. U. Panichi: *Rend. Accad. Lincei, Rome*, **XX**, 421, 518, (1911); *Zeit. Kryst.*, **LIV**, 108, (1915).

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[1] *Sitz. Akad. Wiss. Wien.*, **CXXVI**, 541, (1917) and **CXXVII**, 177, (1918).

[2] Hdb. Mineralchemie, **II**, 2, 311, (1917).

41. "Pseudomesolite," A. N. Winchell: *Am. Geol.*, **XXVI**, 277, (1900).

Scolecite: Doelter's Nos. 9, 16, 24, 25, 27, 28, 29, 39 and 40.

41. T. L. Walker: *U. Toronto Studies, Geol. Ser.*, **14**, 67, (1922).
42. E. G. Radley: *Trans. Roy. Soc. Edinb.*, **LI**, 1, (1915).

In order to study these analyses (and those of laumontite and gismondite) by the same method applied to those of thomsonite it is desirable to adopt more siliceous molecules for the corners of the square, as follows:

	Lime	Soda
More siliceous	$Ca_2Al_4Si_{12}O_{32}$	$Na_4Al_4Si_{12}O_{32}$
Less siliceous	$Ca_4Al_8Si_8O_{32}$	$Na_8Al_8Si_8O_{32}$

It is evident that the lower half of this square is the same as the upper half of the square used for thomsonite.

As before, various points in the square represent various proportions of the four molecules, and these may be read directly from the diagram. Also various points represent varying ratios so far as Al_2O_3:SiO_2 and CaO:Na_2O are concerned, but a constant unit ratio between Al_2O_3 and $CaO+Na_2O$.

The method of finding the point which represents an analysis is much the same as in the preceding case, but if:

$x = Al_2O_3$ molecules in the less siliceous molecules
$y = Al_2O_3$ molecules in the more siliceous molecules, then
$x+y =$ total number of Al_2O_3 molecules in the analysis, and
$2x+6y =$ total number of SiO_2 molecules in the analysis.

Since there are two Al_2O_3 molecules in the less siliceous silicate molecules and one Al_2O_3 molecule in the more siliceous silicate molecules:
$x/2 \div x/2+y =$ percentage of less siliceous molecules.

All of the "superior" analyses of natrolite, mesolite and scolecite are plotted on Fig. 2. A mere glance at the resulting distribution of points is sufficient to show that three minerals are represented, which have little, if any, ability to form mix-crystals, since the points representing the analyses fall in three small groups rather than forming a series. The only analysis suggesting any important amount of solid solution is mesolite 37 which was made by Glinka[3] to show changes from fresh massive state to weathered condition. It is highly probable that the fresh material was not pure mesolite, but an intergrowth of mesolite and natrolite, which is common in this condition according to Böggild.[4] Aside from scolecite 9 which Zambonini[5] reported to be a scolecite closely associated with

[3] *Zeit. Kryst.*, **XLVI**, 287, (1909).

[4] *Kgl. Danske Vid. Sels. Meddel.*, **IV**, 35, (1922).

[5] Mineral. Vesuv. 296, (1910).

thomsonite, the scolecite and natrolite analyses which show any notable variation from the theoretically pure minerals, vary, not toward each other or toward mesolite, but toward thomsonite. As no one supposes that thomsonite can form mix-crystals with scolecite or with natrolite, these analyses probably represent other cases of intergrown zeolites. However, the main point is that the diagram shows no evidence of an isomorphous series from natrolite through mesolite to scolecite, but may be taken as strong evidence that no such series exists.

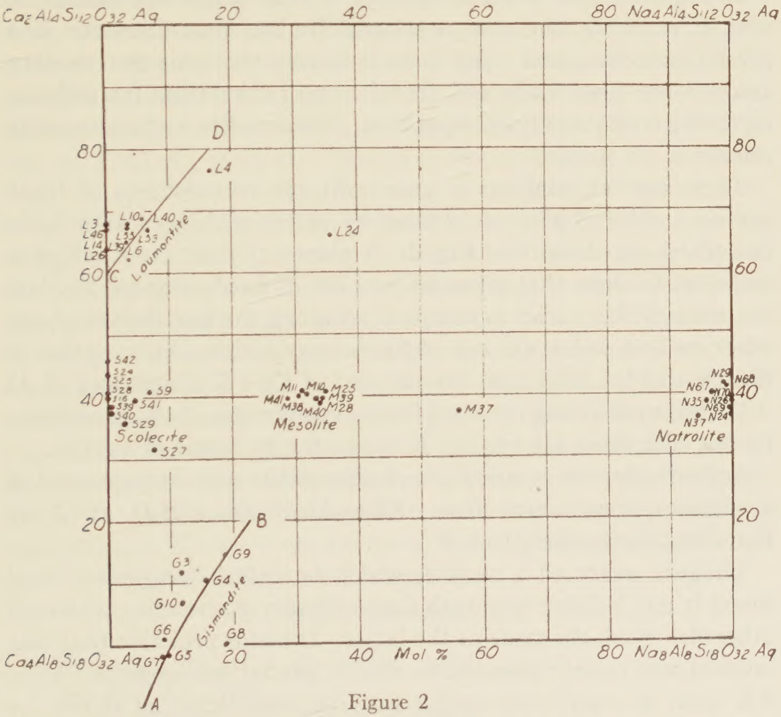

Figure 2

The Composition of Natrolite and Related Zeolites

The composition of natrolite is definite; in the diagram it is 40 per cent $Na_2O.Al_2O_3.6SiO_2$+60 per cent $2Na_2O.2Al_2O_3.4SiO_2$, which is easily reduced to the ordinary formula, $Na_2Al_2Si_3O_{10}$. The composition of scolecite is also definite; from the diagram it is 40 per cent $CaO.Al_2O_3.6SiO_2$+60 per cent $2CaO.2Al_2O_3.4SiO_2$, which is equivalent to the usual formula, $CaAl_2Si_3O_{10}$. The composition of mesolite is equally definite; from the diagram it is

33 per cent $Na_2Al_2Si_3O_{10}$+67 per cent $CaAl_2Si_3O_{10}$, which is equivalent to $Na_2Ca_2Al_6Si_9O_{30}$. Accepting the ordinary view regarding the water this formula may be written: $Na_2Ca_2Al_6Si_9O_{30}.8H_2O$. There is no more evidence that mesolite is composed of one molecule of natrolite with two molecules of scolecite than there is that natrolite, for example, is composed of two $Na_2O.Al_2O_3.6SiO_2$ molecules with three $2Na_2O.2Al_2O_3.4SiO_2$ molecules. Therefore, the formula of mesolite should be written $Na_2Ca_2Al_6Si_9O_{30}.8H_2O$ and not as one natrolite plus two scolecite molecules.

In regard to the other zeolites of a form somewhat similar to that of natrolite, the case of thomsonite has been discussed in a preceding section, and edingtonite is so rare that only one modern analysis has been made and therefore no information is available regarding variations in composition. Gismondite and laumontite remain to be studied.

There are ten analyses of gismondite on record;[6] two of these are very old and give unsatisfactory ratios of Al_2O_3:$CaO+K_2O$; the others are shown[7] on Fig. 2. A glance at their distribution is sufficient to show that gismondite is not of fixed composition, but is a series which varies in composition along the line shown. As in other zeolites which are not of fixed composition, the variation is like that in the feldspars, the number of Ca+K atoms and of Al +Si atoms remaining constant for a given number of oxygen atoms. In this case there are 11 Ca+K atoms for 80 atoms of oxygen.

Accordingly, the composition of gismondite may be expressed as an isomorphous series from $KCa_{10}Al_{21}Si_{19}O_{80}.40H_2O$ at *A* to $K_4Ca_7Al_{18}Si_{22}O_{80}.36H_2O$ at *B*.

Thugutt analyzed a zeolite, which he called "*zeagonite*," and found it much richer in potash than ordinary gismondite, although otherwise much the same as the latter. It seems probable that this mineral was merely gismondite after a partial exchange of Ca for 2 K such as may occur under suitable conditions; as shown by Lemberg,[8] Zoch[9] and others, especially since Walker[10] has shown that potassium mercuric iodide solution, used in separating minerals, causes such a change in gmelinite and presumably in other zeolites. Thugutt later discovered that the "zeagonite" first analyzed is a mixture of phillipsite and levynite, but considered homogeneous "zeagonite" to be a natural dehydration product of phillipsite. Several writers have discussed the close relationships between "zeagonite," gismondite and phillipsite; the close chemical relationship between gismondite and phillipsite is evident by a comparison of Fig. 2 and the figure for phillipsite.

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[6] C. Doelter: Hdb. Mineralch., **II**, 3, 30, (1921).

[7] For gismondite the right hand molecules contain chiefly K_2O rather than Na_2O.

[8] *Zt. Dtsch. Geol. Ges.*, **XXVIII**, 546; **XXXIX**, 582, etc., (1887).

[9] Chemie der Erde, **I**, 219, (1915).

[10] *U. Toronto Studies, Geol. Ser.*, **14**, 48, (1922); *Am. Min.*, **7**, 100, (1922).

There are fifty-three analyses of laumontite listed by Doelter[11] and Shannon[12] has given the composition of a sample from Montana, while Walker[13] has published an analysis of the Nova Scotia mineral. However, the number of modern analyses (since 1880) giving a satisfactory Al_2O_3:$CaO+Na_2O$ ratio is only twelve, including Doelter's Nos. 3, 4, 6, 10, 14, 24, 26, 39, 40, 46, and 53, as well as Walker's analysis. These are plotted on Fig. 2. With the single exception of No. 24 (Fersmann's analysis of "leonhardite" from Simferopol, Russia) they show a variation which is chiefly along the line *CD*, that is, the variation is like that in the feldspars, the Ca+Na atoms and the Al+Si atoms being constant for a given number of oxygen atoms. In fact, there are 7 atoms of Ca+Na for 80 oxygen atoms and the variation can be expressed as from $Ca_7Al_{14}Si_{26}O_{80}.25H_2O$ at *C* to $Na_2Ca_5Al_{12}Si_{28}O_{80}.25H_2O$ at *D*, taking approximately the accepted ratio of water. Since the analysis of "leonhardite" just mentioned contains considerable potash the abnormal position of No. 24 may be due to a change in composition of the zeolite while immersed in potassium mercuric iodide, a change which Walker[14] has shown to occur promptly in gmelinite, and one to be expected in other zeolites.

(*To be continued*)

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[11] Hdb. Mineralch., **II,** 3, 37, (1921).

[12] *Am. Min.,* **6,** 6, (1921).

[13] *U. Toronto Studies, Geol. Ser.,* **14,** 54, (1922).

[14] *Loc. cit.* p. 48, and *Am. Min.,* **7,** 100, (1922).

FAMOUS COLORADO MINERAL LOCALITIES: TABLE MOUNTAIN AND ITS ZEOLITES

J. Harlan Johnson and W. A. Waldschmidt, *Colorado School of Mines*

North Table Mountain near Golden, Colorado, has long been recognized as a mineral locality prolific in splendid museum specimens of various zeolites.

The mountain is an irregular shaped mesa having an area of about three square miles. It consists of basalt flows underlain by early Tertiary sediments. There are two lava flows over most of the mountain. Much of the upper portion of the lower flow has been removed by erosion. Between the two layers is a belt of scoriaceous and highly vesicular material forming the top of the lower flow. This bed varies from five to twenty feet in thickness. Cavities are of all sizes, from a fraction of an inch up to over six feet across. They are usually elongated along the direction of flow.

The zeolites principally occur in (1) the amygdaloidal cavities in the upper portion of the lower flow, (2) as a filling in numerous cracks or fissures in the upper portion of this flow, and (3) in irregular spaces along the contact of the two flows.

These minerals have attracted the attention of many people and have received some careful study. About 40 years ago Cross and Hillebrand, after several preliminary studies[1] published considerable material.[2] The specimens on which these studies were based were obtained principally from the south side of Table Mountain where large quarries were worked for a number of years. Later the Colorado School of Mines opened a small quarry on the east side of the mountain and obtained a wealth of new mineral material. This showed some interesting variations in character and habit from the specimens previously studied from the other locality. Dr. H. B. Patton made a detailed study based on this material.[3]

The minerals noted from these localities include: analcite, apophyllite, chabazite, levynite, thomsonite, mesolite, natrolite, scolecite, stilbite, laumontite, bole, calcite and aragonite.

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[1] *Am. J. Sci.*, 3d Series, **XXIII**, 452, (1882) and **XXIV**, 129.

[2] *U. S. G. S., Bulletin* **20**, (1885).

[3] Thomsonite, Mesolite, and Chabazite from Golden, Colorado. *Bull. Geol. Soc. Am.*, **2**, 461-474, (June), 1900.

The zeolites are divided into two groups by Cross and Hillebrand according to their method of occurrence. The first group includes laumontite and stilbite in granular masses usually reddish in color occupying the floors of some of the cavities and often times lining or filling fissures in the upper crust of the lava.

In the second group the minerals are usually colorless and frequently well crystallized. The following order of deposition was noted by Cross and Hillebrand on the southern side of the mountain: laumontite, stilbite (red or yellowish), thomsonite, calcite (yellow), stilbite, chabazite, thomsonite, analcite, apophyllite, calcite (colorless) and mesolite.

The minerals from the east side of the mountain resemble those from the south side, excepting for the thomsonite, which is unusual in that each generation has a different crystal habit and general appearance.

The chabazite from all the localities is usually well crystallized and colorless or light in color. The crystals are often simple rhombohedrons which on casual observation resemble an isometric or tetragonal form. Many occur as penetration twins. From the eastern locality a number of twins with a highly complex form were noted. These contained several rhombohedrons modified and striated by scalenohedrons.

Analcite is very common in the southern localities. It is rarer at the eastern quarry. This mineral, often beautifully crystallized in trapezohedrons, is usually white in color although very small crystals are colorless and transparent. Crystals several inches in diameter have been noted although the usual size is much smaller (half to an inch or less).

Apophyllite occurs in well developed crystals. The usual form is the prism of the first order modified by a steeply inclined pyramid of the second order. Basal pinacoids occur on some specimens. A few small transparent crystals recently noted appeared also to be modified by a slightly developed pyramid of the same order as the prism. Apophyllite crystals are usually small, seldom attaining a length of more than a quarter of an inch. Many are colorless and transparent; others, especially the larger ones, are white and opaque. This appears to be due largely to the development of an alteration product on the outer surfaces and inward along fractures on the basal cleavages. The largest apophyllite crystals seem to occur in small cavities, smaller ones in large cavities. A few cavities have been found which were virtually filled with a loose granular mass of small perfectly clear crystals. Apophyllite often occurs associated with and partially imbedded in analcite.

Mesolite forms some of the most beautiful and distinctive specimens from the Table Mountain. It frequently occurs in extremely delicate aggregates of long slender hair-like threads. Cavities several inches in diameter have been found completely filled with a cotton-like mass of these fibers. In other specimens the mineral appears as felt-like aggregates. Sometimes gauzy membrane-like deposits occur. Rarely the mesolite forms bristle-like surfaces.

Natrolite occurs sometimes in rounded masses with a well developed radiating fibrous structure. A few large cavities have been found lined with white stubby bristle-like growths of this mineral.

The other minerals listed are either rare in occurrence or usually occur in poorly crystallized condition.

These minerals weather so easily that good specimens can be obtained only in fresh exposures as in quarries. At the present time some material of fairly good grade may still be obtained from the old tramway quarries on the south side of the mountain. The quarries on the east have not been worked for a number of years and little, if anything, can be found there. During the past year a new quarry has been opened on the northwestern edge of the mountain. So far very few specimens have been obtained from it as in general the vesicular cavities are very small, the lava apparently being closer to the point of outflow.

BENTONITE AS A ONE-DIMENSIONAL COLLOID

Edgar T. Wherry, *Washington, D. C.*

Crystal grains may be conveniently classed with respect to their size into four categories, macroscopic, microscopic, colloidal and molecular. When the grains of a given substance are essentially equidimensional, they fit definitely into one or another of these size-classes; but when the habit is strongly fibrous or tabular they may fall simultaneously into two (or even three) classes.

Grains of macroscopic diameter but molecular thickness have actually been prepared by Marcelin.[1] By pressing a bit of melted selenium against a sheet of mica, allowing it to cool, and pulling it off, he obtained flakes found by optical study to be 0.7μ or small multiples of that value in thickness, this evidently representing the diameter of the mica molecule in the direction perpendicular to the cleavage. Again, on crystallizing from alcohol an organic compound with strongly tabular habit, *p*-toluidine, he got crystals 0.3μ, or small multiples, thick, also clearly a molecular dimension.

In the course of the process known by the general term devitrification there should be a good opportunity for crystals falling simultaneously into two size-classes to develop. This may cover unmixing of the constituents of a solid solution, change of a transparent glass into an opaque aggregate, or passage of a colloid[2] into a metacolloid; in all these cases particles originally of submicroscopic dimensions increase to microscopic or even coarser sizes without going into liquid solution in the process. The crystal growth is therefore hindered by the viscosity of the medium in which the molecules move, and if the habit tends to be fibrous or tabular, microscopic dimensions will be attained in one or two directions, while in the remaining directions the diameter of the crystals may still be of colloidal magnitude. If the growth stops soon enough, these size-relations may persist in the final product. The purpose of the present note is to point out that such appears to be the case in the peculiar rock known as bentonite.

Bentonite and related substances have been shown by Hewett,[3] the writer,[4] Nelson,[5] and Ross and Shannon[6] to be a product of devitrification, with partial decomposition, of glassy volcanic ash. The properties of the resulting material are in many respects those characteristic of colloidal gels—it adsorbs dyes and other materials from solutions, and, in some specimens, swells markedly and becomes plastic when wet. At the time the writer's article cited was prepared, the double refraction visible under the microscope was interpreted, in accordance with the usual views at the time, as a strain phenomenon; but the subsequent work of Larsen (cf. Nelson, *loc. cit.*) indicated the presence of minute crystals of a definite mineral, then regarded as leverrierite, though shown by the subsequent studies of Ross and Shannon to be more often montmorillonite. The mystery as to how a rock apparently made up largely of a crystalline mineral could exhibit such distinctively colloidal properties has not thus far been cleared up. The one-dimensional colloid theory was mentioned by the writer in a letter to Jerome Alexander, and quoted by him in his article on bentonite[7]; it is here brought to the attention of mineralogists.

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[1] *Ann. phys.*, **10**, 189 (1918).

[2] The term colloid is here used in the general sense of a substance with particles of less than microscopic but more than molecular dimensions; these particles may be just as definitely crystalline in structure as a microscopic crystal.

[3] *J. Wash. Acad. Sci.*, **7**, 80 (1917).

[4] *J. Wash. Acad. Sci.*, **7**, 576 (1917).

[5] *Bull. Geol. Soc. Am.*, **33**, 605 (1922).

[6] Paper presented simultaneously with this at the annual meeting of Mineralogical Society, Ithaca, New York, December 31, 1924.

When dry bentonite is moistened with an immersion oil and examined under the microscope between crossed nicols, it shows numerous doubly refracting grains. At first sight their aspect is that of fibers, but the way they behave when the cover glass is rubbed around shows that they are really plates, viewed more or less on edge.[8] Here and there through the mount they tend to aggregate themselves, with their flat faces parallel to the slide, and their double refraction is then much weaker; they show, however, distinct biaxial interference figures, with a small axial angle, in convergent polarized light, indicating that groups of them have collected together in essentially parallel position. The simplest explanation of these peculiarities would seem to be that the crystals, of whatever mineral may be present (its chemical composition being of less significance than the fact that it possesses the strong tendency to tabular habit so characteristic of the micas) are plates of microscopic breadth but colloidal thickness.

Various kinds of colloids swell more or less in water, but bentonite sometimes expands to many times its original volume. This is evidently the result of the entrance of the water between the almost infinite number of solid sheets, the broad surfaces of which are capable of exerting capillary attraction better than ordinary (three-dimensional) colloid grains. The plasticity is no doubt connected with the sliding of these sheets over one another, lubricated by the water films. The adsorptive powers for dyes and other substances may well be an expression of the colloidal thinness of the flakes, yielding relatively enormous surface area with respect to quantity of material. The reason why bentonite is better adapted than many typical colloids to technical adsorption operations such as water-softening appears to be that the relatively large breadth of the particles gives their aggregates an open texture, combined with a certain rigidity, which permits the solutions being treated to come into unusually complete contact with the adsorbing surfaces.

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[7] *Ind. Eng. Chem.*, **16**, 1140 (1924).

[8] Two-dimensional colloids, made up of fibers of microscopic length but colloidal diameter, are presumably represented among minerals in some varieties of limonite, wad, etc.

CLERICI SOLUTION FOR MINERAL SEPARATION BY GRAVITY

HELEN E. VASSAR, *Harvard University*

Clerici solution, a mixture of thallium malonate, $CH_2(COOTl)_2$ and thallium formate, $HCOOTl$ is a heavy liquid little known, but it has been prepared and used with much satisfaction in the mineralogical laboratory of Harvard University. At ordinary room temperature the concentrated solution has a density of 4.25. Clerici, in his original article[1] says that by increasing the temperature, the density of a concentrated solution at 35° is 4.4, at 50° about 4.65, and at 90°–100° pyrite floats. It is possible to dilute with water in any quantity and to reconcentrate. It is more mobile than Thoulét solution, odorless and slightly amber colored. As with most heavy solutions care must be taken that minerals such as sulfides are not altered with long standing in hot solutions but at ordinary temperatures the solution appears to be stable and chemically inert.

The solution may be prepared by neutralizing two equal parts of thallium carbonate with equivalent amounts of formic acid and malonic acid, mixing the two solutions of thallium formate and thallium malonate, filtering and evaporating until almandite floats. One hundred eleven grams of malonic acid dissolved in a little water will neutralize 500 grams of thallium carbonate, and

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[1] E. Clerici. Preparazione di liquidi per la separazione dei minerali. *Atti. R. A. Lincei, Rome*, **16**, 187-195 (1907).

Descriptions of the preparation and use of Clerici solution are to be found in P. Eskola: On the Eclogites of Norway, *Videnskap. Skrift., 1MN.Kl., Kristiania*, No. **8**, p. 6 (1921), and in F. Hörner, Beiträge Zur Kenntnis des Staurolits. Inaug. Diss. Heidelberg, **1915**, quoted in Rosenbusch-Wülfing, Mik. Physiographie **I**, p. 692 (1924).

115 grams of 85.5 per cent formic acid will neutralize the same amount of thallium carbonate. One kilogram of thallium carbonate will make approximately 300 cc. of Clerici solution. If the solution is made from the dry salts thallium formate and thallium malonate, 7 grams of each will dissolve completely in 1 cc. of water but 10 grams of each will leave a part undissolved.

Through the kindness of Mr. Sidney J. Jennings, three pounds of metallic thallium were given to the mineralogical laboratory. This metal was worked up into thallium carbonate before it was learned that the salt could be purchased.[2] The thallium carbonate was prepared from the metal by two different methods. The first, which we do not recommend, was to decompose the metal in dilute HNO_3, expel the excess acid by evaporation, dissolve the crystallized thallium nitrate in water and precipitate the lead, which was present as the only appreciable impurity, with H_2S. The solution was again evaporated and the nitric acid expelled with sulphuric acid. The thallium sulfate was dissolved, the SO_3 removed by precipitating with $Ba(OH)_2$ and standing over night. The excess barium was eliminated by passing CO_2 into the solution and again letting the mixture stand over night. The clear solution was then syphoned off and evaporated to dryness on the steam bath. The thallium carbonate was purified by dissolving, filtering and recrystallizing. The process is tedious, and very wasteful for the precipitates carry down a large amount of thallium. The inorganic salts, unlike the organic ones, have such a small solubility that the large quantities of solutions involved were very difficult to manage.

The second method takes time but is simple and wastes none of the thallium. The metal was filed into very small particles, moistened, and let stand with a large surface exposed to warm, damp air. After a day or so the white oxide was dissolved by boiling in water, and poured into another vessel, leaving the moist residue to stand again for some time. A few weeks of this treatment oxidized almost all the thallium. After passing CO_2 through the solution, it was evaporated to crystallization and the thallium carbonate purified by dissolving, filtering and recrystallizing.

The index of refraction in relation to the different specific gravities is shown in the following chart which is only an approximation because of the sensitiveness of the solution to temperature change and evaporation. The specific gravities were determined by the Westphal balance.

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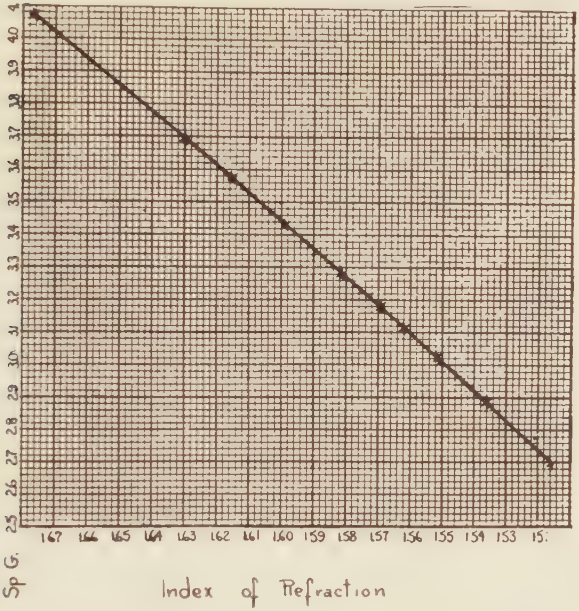
[2] Kahlbaum quoted thallium carbonate in 1924 at $12 per kilo. Metallic thallium is apparently rarely to be had. It comes in small bars of 4 or 5 ounces weight. The price quoted in 1924 was about $8 per kilo.



The measurements upon which the chart is based, are contained in the following table.

TABLE OF MEASUREMENTS AT 19.5°C

INDICES OF REFRACTION	SPECIFIC GRAVITY
1.6761	4.076
1.6296	3.695
1.6154	3.580
1.5990	3.434
1.5815	3.280
1.5693	3.184
1.5620	3.114
1.5515	3.024
1.5363	2.884
1.5156	2.692

I am very much indebted to Prof. Esper S. Larsen for the determination of the indices and to Prof. Charles Palache through whose interest and help the research was undertaken.

A MODIFICATION OF LEMBERG'S STAINING METHOD

Ernest E. Fairbanks, *Reno, Nevada*

Lemberg's solution is commonly prepared by boiling the following constituents together for about 25 minutes:

6	parts logwood chips
4	parts aluminum chloride
60	parts water

Several factors, such as time and concentration, enter into the differential staining properties of this solution. The concentration of the active principle of logwood cannot be controlled by using the above formula. A variable amount of haematoxylin and hematein, active principles of logwood, are obtained by boiling logwood chips. In fact certain varieties of logwood contain a very small amount of this material. This explains why uniform results have not been obtained in staining experiments using a solution of this nature.

The writer has used the following modification of Lemberg's solution with excellent and uniform results:

0.24	grams haematoxylin
1.6	grams aluminum chloride
24	cc. water

This solution is brought to the boiling point and then cooled. A small amount of hydrogen peroxide is then added.[1]

Calcite is distinguished from dolomite in thin section by removing the cover glass and balsam and then applying the stain. If the section has not been recently prepared the cover glass should be easily sprung off with a thin knife blade. The balsam, which cemented the cover glass to the section, is then removed by a brief immersion in xylene. If the section has been recently prepared or the cover glass is not easily removed, the section is placed in xylene until sufficient balsam has been dissolved to permit the cover glass being removed by sliding off over the rock slice. This procedure requires great care otherwise the rock slice will crumble to pieces. The uncovered section is then immersed in the cold solution for about 5 minutes and then rinsed without danger of removing the stain. Upon examination the calcite will be found to have become deeply stained while any dolomite present will remain unaffected. The cover glass may be remounted by placing one drop of a thin solution of balsam in xylene on center of section and then placing cover glass on this drop. Fragments may, of course, be treated in a similar manner.

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[1] The ground or chipped logwood of commerce has been prepared as a dyestuff by being exposed in large moist heaps until haematoxylin has been converted by oxidation to hematein. The solution will not stain calcite without hydrogen peroxide having been added to produce this oxidation.

THE TRANSMISSION OF LIGHT BY CITRINE

Edw. F. Holden, *University of Michigan*

In a recent paper[1] the writer concluded that citrine is probably colored by sub-microscopic particles of hydrous ferric oxide. This belief was based on analyses, and on a comparison of the color of citrine with that of solutions of colloidal hydrous ferric oxide.

Since this former note was published, the writer has measured the transmission of light through two specimens of Brazilian citrine, and through a colloidal solution of hydrous ferric oxide. The measurements were carried out in the Physical Laboratory of this University, by means of a photospectrometer. The percentage of incident light which emerged after passage through the sections was determined, at intervals averaging about $20\mu\mu$, from 457 to $704\mu\mu$. Curves plotted from the results so obtained are shown in Fig. 1.

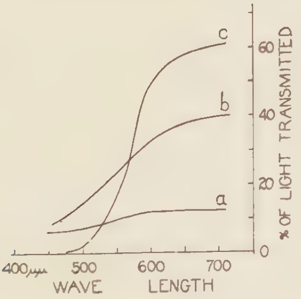

FIGURE 1. Transmission of light through citrine and through a colloidal hydrous ferric oxide solution. (a) Citrine. Color: 19'' 'b (Ridgway); pale yellowish. Thickness of section, 1.7 cm. (b) Citrine. 9k; deep amber. Thickness 0.55 cm. (c) Colloidal hydrous ferric oxide solution. 0.07 per cent Fe_2O_3. 2.0 cm. thick.

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[1] The Color of Three Varieties of Quartz. I. Note on the color of citrine. *Am. Min.*, **8**, 117-118 (1923).

From these curves it is apparent that the transmission of light in citrine and in the hydrous ferric oxide solution is of the same character. In all three curves there is a continuous increase in the amount of transmitted light from the violet to the red end of the spectrum, with no peaks or depressions. Such a spectrum has no absorption bands, but instead shows a gradual darkening from the red to the violet. This is generally true of the spectra of ferric compounds. It is concluded, therefore, that the nature of the transmission spectrum of citrine substantiates the formerly expressed opinion that the color of that mineral is due to a compound of ferric iron.

PROCEEDINGS OF SOCIETIES

NEW YORK MINERALOGICAL CLUB

Regular Monthly Meeting of February 11, 1925

A regular monthly meeting of the New York Mineralogical Club was held in the East Assembly Room of the American Museum of Natural History on the evening of February 11th at 8.15 P.M. In the temporary absence of the president, the vice-president, Dr. Frederick I. Allen presided. There was an attendance of 34 members. Mr. Stanton, speaking for the committee on the Gratacap Memorial Tablet, reported progress and stated that the execution of the tablet had advanced to such a stage that its unveiling might be expected in the near future.

Captain Miller submitted the name of Dr. C. V. R. Bumsted, 235 Graften Avenue, Newark, N. J., to the committee on membership. The committee on membership having failed to report on the candidates for membership submitted at the January meeting, the question of election without action of the committee was raised. It was moved by the Chair that the proposed candidates, including Dr. Bumsted, be elected to membership, if such action should not be found inconsistent with the By-Laws. The motion was carried. The names of the candidates thus elected to membership are:

Miss Grace M. Carhart, Hunter College, New York City.
Mr. C. C. Lawson, Yale University, 124 Prospect Street, New Haven, Conn.
Mr. Frederick A. Sach, c/o Hallgarten & Co., 44 Pine St., New York City.
Dr. C. V. R. Bumsted, 235 Graften Ave., Newark, N. J.

Mr. Stanton raised the question as to the advisability of members joining the Club paying dues for one year in advance. Capt. Miller so moved and the motion was carried. Captain Miller extended to the Club an invitation from the Newark Mineralogical Society to attend their meeting on Sunday, March 1, at 3 P.M. in the Newark Technical School. At this point the President assumed the Chair. Dr. Allen read a notice of the death on February 7th of Dr. William Francis Hillebrand, chief chemist of the Bureau of Standards. He spoke of the eminence of Dr. Hillebrand in the field of mineral and rock analysis, and of the lasting value of his bulletin on the Analysis of Silicate and Carbonate Rocks. He drew attention to the little known fact that Dr. Hillebrand was the first to observe and interpret the helium line as belonging to a new element, although he never published his findings. Dr. Kunz added a number of personal reminiscences of Dr. Hillebrand.

Dr. Allen proposed that the Club draw up a resolution of regret for the loss of Dr. Hillebrand and an appreciation of his work and that the secretary be directed to convey such regret and appreciation in a letter to Dr. Hillebrand's family. The recording secretary accordingly respectfully submits the following resolution to be included in these minutes:

> "The death of William Francis Hillebrand, having been announced at the monthly meeting of the New York Mineralogical Club, held on February 11, 1925, the following resolution was adopted as a testimonial of his services to the science of mineralogy.
>
> The Members of the New York Mineralogical Club have learned with deep regret of the death of Dr. William Francis Hillebrand, eminent chemist and analyst of minerals and rocks.
>
> During a lifetime of devotion to his important and exacting science, Dr. Hillebrand has achieved a very marked distinction. His contributions to the methods of chemical analysis in his chosen field will long endure as the standards for such work and as an inspiration to those who follow where he led.
>
> The members of the New York Mineralogical Club extend their sincere sympathy to Dr. Hillebrand's bereaved family, and have ordered a copy of these resolutions spread upon their records."

The speaker of the evening, Mr. Herbert P. Whitlock, was then introduced and addressed the Club on "*The Art of the Lapidary*." He explained why artificial cuttings are applied to certain minerals to adapt them to jewelry purposes, and defined the terms applied to definite parts of a cut stone. Passing to the operation of cutting and polishing a diamond, he followed the process step by step using lantern slides to illustrate the successive operations. Continuing with the same method of treatment of the subject, he described the modern methods by which the softer stones are shaped, cut and finally polished. In conclusion the speaker dwelt briefly on the percentage of accuracy arrived at by the application of highly developed manual skill, and showed how the superlatively trained hand and eye of the lapidary obtained results that rendered unnecessary the introduction of mechanical devices in this art.

At the close of his address a vote of thanks was tendered to the speaker. Conel Stevenson, a guest at the meeting, exhibited several finely wrought oriental snuff bottles of jade, moss agate and crystal. He commented on the fact that there appeared to be no literature on the subject of these carved objects.

The meeting was adjourned at 9.45 P.M.

HERBERT P. WHITLOCK, *Recording Secretary*

NEWARK MINERALOGICAL SOCIETY

The 71st meeting was called to order on February 1, by President Miller. Fifteen members were present. The minutes of the last meeting were read and approved. The applications for membership of Messrs. Rankin, Sluyter, Carpenter and Hunter were favorably reported upon by the committee and they were duly elected.

Mr. George E. Ashby then proceeded with his lecture on "*The Occurrence of Pyrite and Its Decomposition Products in the Mica of Manhattan Island.*" After his lecture the members adjourned to the auditorium where he proceeded to illustrate some of the points with lantern slides.

Mr. Ashby is the first one outside of our own members to address the Society. At the close of the meeting Mr. Ashby, on motion of Mr. Bates, was elected to honorary membership. WM. H. BROADWELL, *Secretary*

The 72nd regular meeting of the Newark Mineralogical Society was called to order at 3 P.M. by President Miller; 16 members and 11 visitors were present. After a short business session all present proceeded to the auditorium where M. W. Twitchell, Ph.D., Assistant State Geologist gave a lecture on "*The Mineral Resources of New Jersey.*" This address was illustrated with lantern slides, maps and specimens. The lecture was a revelation to many on the natural resources of their State. Due to a heavy rain there were only about 50 present.

At the close of the lecture members and friends adjourned to the St. Francis Hotel for dinner.

WM. H. BROADWELL, *Secretary*

PHILADELPHIA MINERALOGICAL SOCIETY

Academy of Natural Sciences, March 12, 1925.

A stated meeting of the Philadelphia Mineralogical Society was held on the above date, with the vice-president, Mr. Trudell, in the chair. Thirty members, and eleven visitors were present.

Dr. Harry Windsor was elected an annual member, and Mr. Samuel Perlstein a junior member.

Mr. Cienkowski reported finding microcline crystals, chalcopyrite, and calcite at the Holmesburg Granite Co. quarry, Phila. Mr. Arndt reported laumontite stilbite, and calcite from the new Wynnewood quarry.

Dr. L. C. Wills then addressed the society on "*Mineralogy through the Microscope.*" The collection, preparation, and mounting of small specimens for study under the binocular microscope were discussed. The chief advantage of a collection of this kind is the increased opportunity to obtain perfect crystals which it affords to the collector. The cost is no greater and the storage space required is considerably less.

With the assistance of a number of the members, the speaker had arranged a series of nine binocular microscopes, through which all present were enabled to examine a large number of very fine specimens. After tendering a vote of thanks to the speaker the meeting adjourned.

HORACE R. BLANK, *Secretary*

NEW MINERALS: NEW SPECIES

CLASS: PHOSPHATES, ETC.

Sincosite.

Waldemar T. Schaller: The Occurrence and Properties of Sincosite, a new Vanadium Mineral from Peru. *Am. Jour. Sci.*, **8**, 462, (1924). (Preliminary note in *Jour. Wash. Acad. Sci.*, **12**, (8), 195, 1922. Cf. *Am. Min.*, **7**, 163, 1922.)

Name: From the locality, *Sincos*, Peru.

Chemical Properties. A hydrous vanadyl, lime phosphate, V_2O_4. CaO. P_2O_5. $5H_2O$. Analysis: V_2O_4 36.3, V_2O_5 0.0, CaO 12.1, P_2O_5 31.7, H_2O 19.9, insol., 0.3; sum 100.3. Soluble in dilute acids giving a blue solution.

Crystallographic Properties. Tetragonal, basal plates bounded by the prism *a* (100). Basal plane striated parallel to the edges. Twinning plane *m* (110).

Physical and Optical Properties: Color leek green. Uniaxial, but some crystals are biaxial with 2E varying. Negative. $\epsilon = 1.655$, $\omega = 1.680$. Dispersion strong $\rho > \nu$. Pleochroism strong, ϵ=nearly colorless to pale yellow, ω=gray green. Plates change from uniaxial to biaxial with 2V as high as 83°. Dispersion increases with 2E. $\alpha = 1.675$, $\beta = 1.690$, $\gamma = 1.693$. The biaxial phase is probably a lower hydrate. Sp. Gr. 2.84. Cleavage basal and *a* (100) good, *m* (110) poor.

Occurrence: Found in a black carbonaceous shale associated with black nodules of coaly material.

Discussion: Believed by Schaller to be a member of the uranite group, together with torbernite and metatorbernite, which the sincosite greatly resembles.

W. F. Foshag

CLASS: PHOSPHATES, ETC.

Dumontite.

Alfred Schoep: La Dumontite, nouveau Minéral radioactif. (Dumontite, a new radioactive mineral). *Compt. Rend.*, **179**, 693 (1924).

Name: In honor of André *Dumont*, Belgian geologist.

Chemical Properties: A hydrous phosphate of lead and uranium, 2PbO. $3UO_3$. P_2O_5. $5H_2O$. Analysis: H_2O 5.78, P_2O_5 8.65, UO_3 56.49, PbO 27.19, TeO_3 1.01; sum 99.12.

Crystallographic Properties: Probably orthorhombic, prismatic, flattened parallel to the *a* axis. Forms: (001), (010), (100), (013), (011). $\dot{c}:b = 1.327$ (approx.)

Physical and Optical Properties: Color yellow. Streak yellow. Translucent. Biaxial with 2V large, positive. Plane of the optic axes parallel to the elongation. *n* greater than 1.78. Extinction parallel. Pleochroism strong, *Y*=deep yellow, *X*=pale yellow.

Occurrence: Found in pockets in torbernite from Chinkolobwe, Belgian Congo.

W. F. F.

CLASS: SILICATES

Sklodowskite

Alfred Schoep: La Sklodowskite, nouveau Minéral radioactif. (Sklodowskite, a new radioactive mineral). *Compt. Rend.*, **179,** 413 (1924).

Name: In honor of Mme. Curie-*Sklodowska.*

Chemical Properties: A hydrous silicate of uranium and magnesium, $MgO. 2UO_3. 2SiO_2. 7H_2O$. Analysis: H_2O 13.41, SiO_2 14.28, UO_3 64.72, MgO 3.74, TeO_3 1.08, Na_2O+K_2O 1.79, NiO 0.20; sum 99.40. Analysis on material shown to be homogeneous by microscopic examination.

Crystallographic Properties: Orthorhombic, prismatic.

Physical and Optical Properties: Color, pale lemon yellow. Brilliant luster. Translucent. Streak yellow. Pleochroism, Z=yellow, Y=pale yellow, X=colorless. Biaxial, negative. Dispersion distinct. (Plane of the optic axes across the prisms.) $\alpha=1.613$, $\beta=1.635$, $\gamma=1.657$. Sp. Gr. 3.54.

Occurrence: Found in cracks in a siliceous breccia carrying some fragments of kasolite. W. F. F.

CLASS: SILICATES

Kalithomsonite.

Samuel G. Gordon: Minerals obtained in Greenland on the Second Academy—Vaux Expedition, 1923. *Proc. Acad. Nat. Sci. Phila.*, **76,** 261 (1924).

Name: In allusion to its composition, a *thomsonite* with a considerable percentage of potash (*Kalium*).

Chemical Properties: A hydrous silicate of soda, potash, lime and alumina, $(Na,K)_2O. CaO. 2Al_2O_3. 5SiO_2. 5H_2O$. Analysis: SiO_2 38.09, Al_2O_3 26.61, Fe_2O_3 tr., MnO 0.79, CaO 5.72, MgO 0.87, Na_2O 3.62, K_2O 5.65, H_2O+ 12.00, H_2O- 6.40; sum 99.75.

Crystallographic Properties: Orthorhombic.

Physical and Optical Properties: Color, pale vinaceous pink. Biaxial, positive. $\alpha=1.535$, $\beta=1.537$, $\gamma=1.545$. X=*b*, Y=*a*, Z=*c*. Cleavage, *b* perfect, *a* less so, *c* imperfect.

Occurrence: Found as a matted mass of small prisms in a pocket in augite-syenite at Narsarsuk, Greenland, associated with quartz, microcline, fluorite, epididymite, elpidite, calcite, albite and aegyrite.

Discussion: The high content of potash, equalling the soda molecularly, should give this mineral a species rank. If the soda and potash are not isomorphous the formula becomes $K_2O. Na_2O. 2CaO. 4Al_2O_3. 10SiO_2.10H_2O$. W. F. F.

DOUBTFUL SPECIES

CLASS: SULPHIDES; DIVISION: $R'': S=2:1(?)$

Violarite

Waldemar Lindgren and Myron Davy: Nickel Ores from the Key West Mine, Nevada. *Econ. Geol.*, **19**, 309 (1924).

Name: From the Latin *violaris* = violet, in allusion to its violet-gray color on the polished surface.

Chemical Properties: A sulfide of nickel, suggested to be Ni_2S, but no analysis is given.

Physical Properties: Color violet gray. Brittle. Alters rapidly in air and tarnishes readily.

Occurence: Found with pyrite, chalcopyrite and pentlandite at the Key West Mine, Clark Co., Nevada, as a replacement of the pentlandite. The Sudbury polydymite is shown to be a mixture of pentlandite and violarite in about equal amounts.

Discussion: The same mineral has been found in S. E. Alaska by Dr. A. F. Buddington (*Econ. Geol.*, **19**, 521, 1924). He gives the following additional data: Cleavage in three directions. $H=4-4\frac{1}{2}$. Non-magnetic. This mineral is possibly a member of the pyrite group; the sulfide analogue of chloanthite or of the marcasite group analogous to rammelsbergite. Until accurate analyses of the pure material is given the mineral is doubtful. W. F. Foshag.

CLASS: PHOSPHATES, ETC. DIVISION: $R'':R'''''':R''''':H_2O=1:2:6:X$.

Rauvite

Frank L. Hess: New and Known Minerals from the Utah-Colorado Carnotite Region. *Bull. U. S. Geol. Survey*, **750**, 63, (1924).

Name: From the chemical symbols of radium, *Ra*, uranium, *U*, and vanadium, *V*.

Chemical Properties: A hydrous calcium uranium vanadate, $CaO.\ 2UO_3.\ 6V_2O_5.\ 20H_2O$. Analysis: UO_3 20.82, V_2O_4 2.05, V_2O_5 36.33, CaO 2.00, K_2O tr., As_2O_5 tr., Fe_2O_3 2.39, H_2O 13.38, Se tr., MgO 0.12, SO_3 0.13, insol. 24.06, sum 101.28.

Physical and Optical Properties: Compact with slickensided surface. Color purplish black. Streak light brown. $n=1.88$. Apparently metacolloidal.

Occurrences: Found in cracks in sandstone associated with carnotite, hewettite, gypsum, hyalite and meta-torbernite at Temple Mt., San Rafael Swell, Utah.

Discussion: While this material is apparently new its metacolloidal nature makes it impossible to determine whether this is a single mineral or not. Its exact nature must be considered doubtful. W. F. F.

CLASS: PHOSPHATES, ETC. DIVISION: $R''':R''''':H_2O=3:2:8$.

Ferrisymplessite

T. L. Walker and A. L. Parsons: The Arsenates of Cobalt, Nickel and Iron Observed in the Silver-bearing Veins at Cobalt, Ontario. *Contributions to Canadian Mineralogy*, p. 16, **1924**.

Name: From its composition, a *ferric* arsenate with the ratios of *symplessite.*

Chemical Properties: A hydrous arsenate of ferric iron, $3Fe_2O_3 \cdot 2As_2O_5 \cdot 16\ H_2O$. Analysis: As_2O_5 38.79, CoO 16.86, NiO 5.73, CaO 1.46, MgO 1.05, Fe_2O_3 11.67, Al_2O_3 0.31, H_2O 24.05, insol. 0.88, sum 100.80. (Analysis made on material containing much erythrite and annabergite).

Physical and Optical Properties: Color deep amber brown. Luster resinous. Fibrous. Under the microscope slightly pleochroic, strongly birefracting. $n=1.650$. Sp. Gr. 2.885.

Occurrence: Found associated with erythrite and annabergite in the upper workings of the Hudson Bay Mine, Colbalt, Ontario.

Discussion: Suggested to be the arsenate analogue of kertschenite but the mineral needs further study. W. F. F.

CLASS: PHOSPHATES, ETC. DIVISION: $R'':R''''':CO_2:H_2O=6:2:1:X$.

Grodnolite

M. J. Morozewicz: La Grodnolite, Phosphate colloidal de Calcium. (Grodnolite, a colloidal phosphate of calcium). *Bull. Soc. Fr. Min.* **47**, 46 (1924).

Name: From the locality at which it was found, *Grodno*, Poland.

Chemical Properties: A carbonato-phosphate of calcium. Analysis: P_2O_5 32.65, CO_2 5.10, SiO_2 3.13, Fe_2O_3 3.68, Al_2O_3 1.43, CaO 51.24, H_2O 3.23.

Physical Properties: Color Brown. Isotropic, $n=1.605$. Sp. Gr. 2.974. H= less than 4.

Occurrence: Found as nodules in a sandy marl near Grodno, Poland.

Discussion: This mineral differs in no essential respect from collophanite and is undoubtedly that mineral. The alumina and silica may be adsorbed but since microscopic examination showed inclusions of quartz, microcline, etc. they are more likely derived from soluble silicates. In the latter case the mineral is a normal collophanite. (See A. F. Rogers: Collophane, a much neglected mineral, *Am. Jour. Sci.*, **3**, 269, 1922.) W. F. F.

CLASS: SILICATES

Bardolite

M. J. Morozewicz: Sur la Bardolite, mineral chloritique pyrogéne. (Bardolite, a pyrogene, chlorititic mineral.) *Bull. Soc. Fr. Min.* **47**, 49 (1924).

Name: From the locality at which it was found, *Bardo*, Poland.

Chemical Properties: A hydrous silicate of iron, alumina, magnesia and potash. Analysis: SiO_2 38.45, Al_2O_3 6.09, Fe_2O_3 17.00, FeO 4.74, CaO 0.59, MgO 9.68, K_2O 4.65, Na_2O 0.35, H_2O 19.50, sum 99.78.

Physical and Optical Properties: Sp. Gr. 2.73. Birefringence strong, pleochroism feeble.

Occurrence: Occurs as radiated plates in a fresh diabase. Believed by Morozewicz to be a primary mineral.

Discussion: This mineral falls within the range of the mineral stilpnomelane, being, however, somewhat higher in potash. It can then be appropriately grouped with stilpnomelane unless more detailed work on this group shows it to be distinct. (See Frank F. Grout and George A. Thiel: Notes on stilpnomelane, *Am. Min.* **9**, 228, 1924.) W. F. F.

CLASS: SILICATES. SUB-CLASS: HYDROUS SILICATES. DIVISION: $R'':Si : H_2O = 2:1:1$.

Radio-active Chrysocolla

E. Puxeddu and E. Manca. Radioactive Chrysocolla from the Bena de Padru Mine. *Ann. Chim. Applicata,* **14**, 123 (1924).

Name. Suggested to be new but no name given to it.

Chemical Properties: A hydrous silicate of copper, $Cu_2SiO_4 + H_2O$. Analysis: SiO_2 20, CuO 72.1, H_2O (loss at 100°) 4.5, (loss at 200°) 6.9, PbO 0.6, Fe_2O_3 0.3, CO_2 1.1, S 2.0.

Physical and Optical Properties: Color black to brown. Colloidal and radioactive.

Occurrence: Found with other copper ores at Bena de Padru.

Discussion: This may fall within the range of chrysocolla, especially the variety copper-pitch ore which it apparently resembles in physical properties.

W. F. F.

CLASS: SILICATES, TITANATES

Kalkowskyn

Eberhard Rimann: Ein neues Mineral, Kalkowskyn. (A new mineral, kalkowskite), (Preliminary description). *Centr. Min. Geol.,* **1925**, p. 18-25.

Name: In honor of the mineralogist, Prof. Ernst *Kalkowsky.*

Chemical Properties: A ferric titanate, $(Fe, Ce)_2O_3 . 4(Ti, Si)O_2$. Analysis: SiO_2 5.63; TiO_2 54.62; $(Ta, Cb)_2O_5$ 1.67; Fe_2O_3 28.66; Ce_2O_3, etc. 2.66; P_2O_5 0.28; Al_2O_3 2.21; CaO 1.64; MgO 0.48; K_2O 0.67; H_2O 3.27. The sample carried some mica and monazite. Partially decomposed by hydrochloric acid.

Physical and Optical Properties: Color black, dark to light brown. Streak, red brown. Luster, semi-metallic, waxy or horny. Index of refraction greater than 1.769. Birefringence weak. Nonpleochroic. $H = 3-4$. Sp. Gr. 4.01. Fracture conchoidal. No cleavage.

Occurrence. Found as platy grains in a schistose mass of fine flaky muscovite, associated with zircon and monazite at Serra do Itacolumy, Minas Geraes, Brazil.

Discussion: The exact relationship of this mineral is not clear. If the silica is included in the mineral the ratios are not far from 1 R_2O_3. 4 RO_2. If however the silica is foreign, the recalculated percentages of TiO_2 and R_2O_3 are 60.8 and 33.9, respectively, or not essentially different from arizonite. Rimann suggests that its partial decomposition by hydrochloric acid distinguishes it from arizonite. The description of arizonite (Chase Palmer: *Am. Jour. Sci.,* **28**, 355, 1909.) gives this mineral as being partially decomposed by hydrochloric acid. W. F. F.

NOTES AND NEWS

Attention is called to the reduced rates on reprints which become effective with the May issue (see cover 2) These rates are considerably lower than those previously charged and are based on the assumption that an increased volume of business will result. It is hoped that more contributors will now avail themselves of the opportunity of securing reprints of their articles.

To the list of minerals found around Middletown, Conn. (*Am. Min.*, **7**, 4-12, 1922; **10**, 19, 1925), Mr. J. F. Schairer wishes to add pickeringite. The best material occurs under ledges in beautiful white needles in cavities in the massive mineral. It was identified by qualitative and quantitative analyses. The mineral occurs at the Strickland Quarry, Collins Hill, Portland, Conn., and is derived from solutions from the contacts between the pegmatite and Bolton schist.

Mr. Miltiades L. Glenn, a member of the Mineralogical Society, died on March 3 at his home at Wesleyville, Pa. Mr. Glenn was a chemist employed by the General Electric Co., but his interest in mineralogy and geology was evidenced by his fine mineral collection and the evening classes in mineralogy which he instructed in the Wesleyville Public Schools.

Cambridge University proposes to confer an honorary degree upon Professor John Joly, professor of geology and mineralogy in the University of Dublin.

Mlle. Irene Curie, daughter of the discoverers of radium, received the degree of doctor of science at the Sorbonne, on April 1.

Dr. Robert Sosman, of the Geophysical Laboratory of Washington, has given a series of lectures at the Massachusetts Institute of Technology on the composition, temperature, structure and elastic qualities of the interior of the earth.

Dr. Walter Gossner, professor of mineralogy at the University of Tübingen, has been invited to occupy the chair of mineralogy and crystallography at the University of Munich.

Dr. W. P. Davey, of the Research Laboratory of the General Electric Co., gave two lectures at the Massachusetts Institute of Technology. The first was on "Atomic and ionic shapes and sizes and the nature of chemical combination." The second was on "The theory of solid solutions and the theory of ductility."